

Landmarks of Mystery

Havens for imperiled plants and animals, Carolina bays are themselves at the brink of extinction.

by Steve Bennett

From the first time the two of us waded into Cathedral Bay, we knew we had found a special place. Dark, tea-stained water caught us mid-thigh, chilling us slightly on that early June morning.

This chill was soon forgotten, however, as we passed beneath the towering pond cypress trees filling the bay. Massive buttressed trunks supporting a vaulted green ceiling of limbs formed hallways frequented by an occasional prothonotary warbler and banded water snake.

Two months of searching had finally yielded a Carolina bay worthy of protection. Not knowing that this one already was known as Chitty Pond, we decided to call it Cathedral Bay, a name that seemed appropriate to such a setting. Intensive analysis of data and aerial photos had preceded our field work, months of laying the foundation for on-site visits. As researchers with the South Carolina Wildlife and Marine Resources Department's Heritage Trust Program, we had committed to a comprehensive five-year study of these remarkable formations.

Since our "discovery" of the bay, we have seen it filled with water and completely dry, green with spring's new growth and bare in midwinter. Each visit has offered a new insight into the life of this vibrant ecosystem—a unique and enduring place in South Carolina, one of the mysterious Carolina bays.

Viewed from an airplane, Carolina bays are an astonishing sight. Scattered across the Atlantic coastal plain from northern Florida to Virginia, thousands of elliptical-shaped depressions dot the earth below, all pointing in the same general direction. These intriguing landmarks have defied scientific explanation since their discovery more than two centuries ago.

The first mention of a Carolina bay is found in the journal of eighteenth-century naturalist John Lawson. While exploring the

interior of South Carolina, his party was forced to cross a low, swampy area, which he termed a "percoarson" (pocosin) after the Algonquin word meaning swamp on a hill. Lawson's choice of a name points to the fact that pocosins are generally found on the broad, flat plains between rivers and streams instead of in close proximity to waterways where swamps usually occur.

Lawson is also responsible, in all likelihood, for naming these shallow depressions "bays." The fact that bays are wetlands, holding water in their basins for portions of the year, has led to some confusion over this designation. Many people believe it is derived from the word embayment, meaning a body of water, but this is not true. Instead, Lawson was struck by the abundance of evergreen bay trees—primarily loblolly, Virginia and red bay—found within these swamps.

"One thing is very remarkable," he noted in his journal, "there growing all over this swamp a tall, lofty bay tree, but is not the same as in England, these being in their verdure all the winter long."

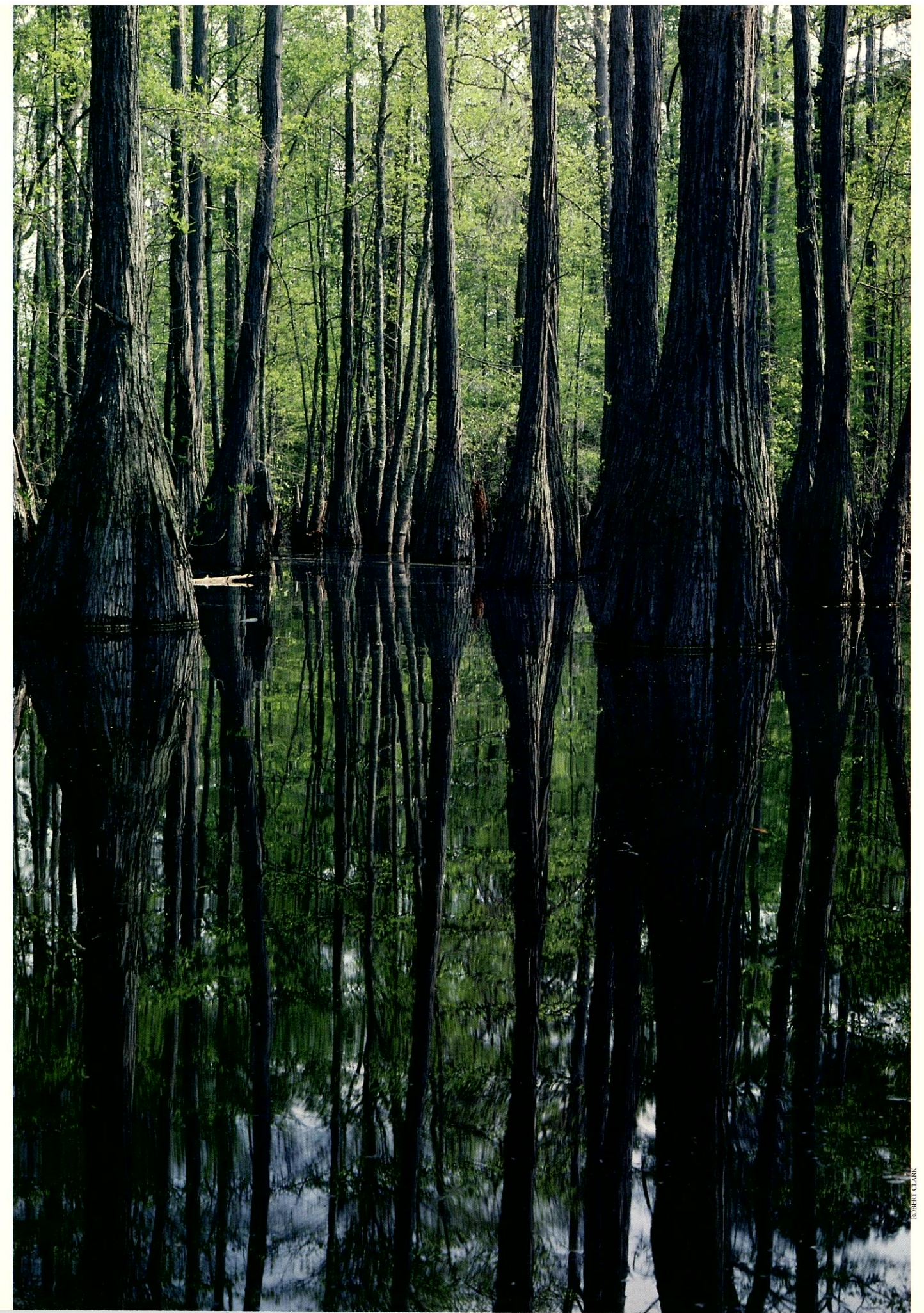
Subsequent naturalists, the Bartrams in particular, explored and described bays as they journeyed throughout the Southeast. Accounts of lotuses, water-lilies, bay and gum trees, and the wondrous pitcher plants fill the Bartrams' journals.

William Bartram was particularly struck with the Venus' fly trap, and penned this elaborate description: "Astonishing production! See the incarnate lobes expanding ... ready on the spring to entrap incautious deluded insects! What artifice! There, behold one of the leaves just closed upon a struggling fly; another has gotten a worm; its hold is sure, its prey can never escape—carnivorous vegetable! ... This wonderful plant seems to be distinguished in the creation, by the Author of nature, with faculties eminently superior to every other vegetable production...."

The real mystery of Carolina bays began to surface in 1847. In that year Michael Tuomey, state geologist for South Carolina, gave a description of bays in his *Report on the Geology of South Carolina*. He noted that they were circular depressions, flat and shallow, unlike lime sinks, which were deep and conical. He compared them to racetracks and began to study them for clues to their origin.

Tuomey's work was paid little heed by his peers; however, half a century later, another geologist stole his thunder.

17. Cathedral Bay Heritage Preserve, Bamberg County.





18-19. Viewed from the air, Carolina bays are among Earth's most striking landforms, dark green ovals rimmed by gleaming white sand. The dry, sandy habitat bordering some (but not all) bays stands in stark contrast to the swampy interior—a near-desert environment within feet of a lush oasis. Exploring a bay's margin may afford a glimpse of a rare Venus' fly trap, or a not-so-rare cricket frog.

In 1895, Leonidas Glenn published an account of Carolina bays in *Science*, then the premier American journal of its kind. Through this article Glenn achieved notoriety as the man first credited with the scientific description of these features. It would be years before the work of Lawson, the Bartrams and Michael Tuomey would resurface in the scientific literature.

While Glenn was not the first to describe bays he holds a key position in the history of their research. In his work, Glenn described several characteristics of Carolina bays that he felt must be explained by any proposed origin theory, including their oval shape, their northwest-southeast orientation, the parallelism of their axes, and their elevated sand rims. In doing so he put the pieces of the Carolina bay mystery together in writing for the first time.

Glenn's published work opened the floodgate, and geologists interested in the origin of Carolina bays rushed in. The early 1900s were the heyday of Carolina bay research, with numerous theories of origin proposed then subsequently discounted.

Origin theories ranged from formation by artesian springs or ancient estuaries to scour holes made by giant seagoing creatures. Many of these theories centered on the fact that the sea once covered the Atlantic coastal plain. This ancient sea began receding approximately ten thousand years ago, and perhaps this process had some bearing on the formation of bays.

The most intriguing theory of Carolina bay origin—one that continues to capture people's imagination today—resulted from the invention of the airplane and the opportunity for aerial photographs. Prior to man's gaining the ability to view the earth from above, many Carolina bays went unrecognized, even by people whose homes and farms were located right next to them. Aerial photos taken in the Myrtle Beach area in 1930 led to an astounding—although accidental—discovery. South Carolina author Henry Savage recounts the event in his 1982 book, *The Mysterious Carolina Bays*.

"... When the photo runs had been flown and the prints developed ... Edwin H. Corlett noted the presence of numerous mystifying elliptical features, some small, some very large, all possessing such an amazing geometrical perfection that they seemed artificial, particularly some that seemed to be marching across the wooded plain heading towards the ocean strand. Intrigued, Corlett pondered the origin of these strange features. To him they had the look of earth scars resulting from the impact of a swarm of meteors...."

Corlett shared his theory with a geologist, Dr. Frank Melton, and a physicist, Dr. William Schriever, both of the University of Oklahoma. This event marked the beginning of years of research by Melton, Schriever and others to determine if Carolina bays were formed by meteors.

But while scientists sought conclusive evidence, the public was quickly convinced. Popular articles such as one entitled "The Comet That Struck the Carolinas," published in *Harper's Magazine* in 1933, captured the nation's imagination and the sensational theory soon won widespread acceptance.

While a meteorite strike could account for the shape and orientation of bays, the theory leaves some fundamental questions unanswered. For instance, where are the meteorite fragments? To date none have been found.

PHOTOGRAPHS BY PHILIP JONES



Attempts to solve the Carolina bay mystery continue into the present day. Recently, R. T. Kaczorowski, a University of South Carolina graduate student, used a wind tunnel to demonstrate that wind blowing in a constant direction can cause water-filled basins to take on an elliptical shape. His findings indicate that natural processes could be responsible for the formation of Carolina bays. After decades of research, however, scientists have yet to agree on any one explanation.

Although the ancient origin of Carolina bays remains veiled in mystery, recent studies make one fact clear: our bays are vanishing at an alarming rate. Hundreds have been laid waste by logging, highway construction and conversion to agriculture. As recently as the 1970s, the federal government encouraged farmers to drain these isolated wetlands and plant them with soybeans.

In 1983, the South Carolina Heritage Trust Program, concerned about the destruction of Carolina bays, launched a five-year project to identify and save the best remaining bays in our state. Hundreds of hours were spent examining aerial photographs to determine the location of every bay two acres or larger and to assess their condition. Although earlier estimates set the number of Carolina bays in the state as high as 200,000, at the conclusion of this phase we had pinpointed only 2,651 bays scattered across twenty-nine counties.

Further analysis of the photographs narrowed the number of candidates to 613 bays that appeared to be in a relatively natural state. However, on-site inspections of these bays made over a four-year period revealed that only 219 had escaped significant human alteration, and only 36 of these were in exemplary condition. The majority had either fallen into ruin since the photographs were shot or we had misinterpreted their condition when examining the photos.

These findings reveal the vast amount of alteration Carolina bays have undergone. The sad truth is that this trend is continuing and more and more bays are drained, logged or paved over every year. One obvious conclusion supported by these findings is that the need to protect our few remaining bays is urgent.

The other major conclusion of our study, and others focusing on the biological aspects of Carolina bays, is that these isolated wetlands are home to an array of plants and animals, providing vital habitat for numerous birds, reptiles, amphibians and invertebrates. As human populations expand and green spaces shrink, Carolina bays offer wildlife natural oases in the midst of a man-made desert.

Only a few miles from the high-rise hotels lining the Grand Strand, black bears find sanctuary among the bays dotting Horry County. Here the bays are usually filled with dense tangles of blueberries, huckleberries, doghobble, fetterbush and catbrier, forbidding places for human intruders but ideal refuges for secretive bears.

Carolina bays, we discovered, harbor dozens of endangered plant species, including Canby's dropwort, one of the rarest plants in the state. Until recently, this species was thought to grow in only four places in the world. As a result of the Carolina bay project, eleven more sites have been added to the list.

The dense, shrubby plant community typical of Carolina bays in Horry and Marion counties has inherited the old Algonquin word "pocosin" as its name. Pocosin vegetation is found growing in soils rich in peat. The acidic soils provide excellent habitat for carnivorous plants, such as pitcher plants and Venus' fly traps. In fact, the only populations of Venus' fly traps remaining in South Carolina occur along the margins of several Carolina bays in Horry County.

For the most part, Carolina bays are isolated, temporary wetlands. The shallow basins collect rainwater and runoff, holding it above the normal water table. Most bays fill and dry with the rainfall cycle, hence their classification as temporary wetlands.

Researchers at the Savannah River Ecology Lab near Aiken discovered that the periodic flooding and drying of bays is important in the breeding strategy of many amphibian species. Frogs and salamanders, which lay eggs in water and undergo an aquatic larval stage, risk being eaten by fish in permanent ponds



PHOTOGRAPHS BY PHILIP JONES

20-21. Dense stands of pond cypress crowd the interiors of many Carolina bays. Around the swollen trunks, bands of grey mineral deposits mark the rise and fall of fluctuating water levels. The inconstant supply of water prevents fish from inhabiting most bays. Consequently, these temporary wetlands offer safe nurseries for toads to deposit their eggs (above), as well as seasonal homes for reptiles, such as the Florida cooter.





ROBERT CLARK



ROBERT CLARK

22-23. From towering cypress and pine trees to delicate wildflowers, Carolina bays sustain a profusion of plant life. Dense thickets of doghobble, fetterbush and catbrier offer sanctuary to a host of wildlife—from songbirds to black bears.

or streams. Bays, which dry completely, generally lack established fish populations and therefore provide ideal breeding sites for amphibians.

Spring-fed Carolina bays, which contain water year-round, have been found. While this phenomenon is unusual, it occurs in some of our better-known bays. Lake Waccamaw in North Carolina and Woods Bay in South Carolina are both spring-fed bays. Woods Bay is now a state park, the first Carolina bay purchased for protection purposes in South Carolina. An outflowing stream at Woods Bay once powered a grist mill.

Lake Waccamaw, though it occurs in a neighboring state, deserves mention for its contribution to our state—the Waccamaw River. The Waccamaw is the only river in the world that originates from a Carolina bay.

Carolina bays in their natural state can range from open water lakes to pond cypress savannas, depression meadows or pocosins or several other wetland plant community types. The particular plant community or communities present depends on the soil, whether it is peat or mineral, the depth of the basin, how long it holds water and to what depth, and numerous other factors.

One interesting discovery made during this study is the difference between bays in North and South Carolina. While these two states have been reported to share, approximately equally, 80 percent of the known Carolina bays, their bay populations exhibit marked differences. Bays in North Carolina are predominantly of the pocosin, or pond pine woodland, variety—communities associated with deep peat deposits. In

South Carolina, these peat-filled bays are found almost exclusively in Horry and Marion counties.

The majority of South Carolina bays do not contain large deposits of peat. Most possess an impermeable clay lens or layer lying under the mineral soil of the basin. This clay layer acts to hold the rainwater in the bay basin. These clay-based bays support vegetative communities that are distinct from those of peat-based bays.

A bordering rim of low sandhills is a puzzling feature of some Carolina bays. These exist as small crescents of dry, sandy habitat occupied by longleaf pine, prickly pear cactus, scrub oak and other plants adapted to life in dry sandy soil. Where they occur they are obvious, striking features, usually clinging to the southern or southeastern edge of a bay, but occasionally circling the entire bay perimeter.

Adherents of the meteorite theory of bay formation contend that these sand dunes were bulldozed up by the impact of meteors crashing into the earth. Although sand rims were once believed to be a typical feature of all Carolina bays, recent investigation has shown that most bays lack them.

Carolina bays have been a part of South Carolina for thousands of years, and yet we have come perilously close to eliminating them from our state. The thirty-six bays approved as protection projects represent the finest examples of these vanishing landforms remaining in our state. They are scattered across the coastal plain, affording good regional representation and ranging in size from less than ten acres to hundreds of acres.

To date the Heritage Trust Program, working closely with The South Carolina Nature Conservancy, has purchased all or part of five bays and has secured conservation easements on three more. Efforts to protect the remainder of the thirty-six bays continue as does our effort to educate and inform people about these unique features and the jeopardy they face.

Carolina bays are not worthless swampland that should be condemned to drainage or alteration. They are instead an important and fascinating part of our state's natural heritage. Some might argue that a drained, ditched bay planted in soybeans is still an elliptical depression oriented along a northwest-southeast axis and therefore still technically a Carolina bay. But for many of us, that just will not do. We demand pond cypress or black gum trees or maybe a dense pocosin with Venus' fly traps and pitcher plants fringing its edge. We want, and deserve, examples of these special South Carolina landmarks for our enjoyment and for the enjoyment and wonder of future generations. 🐾

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